EXHIBIT S

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	And All Others Similarly Situated	
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15	LIMITED STATES	DISTRICT COURT
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17	SOUTHERN DISTI	RICT OF NEW YORK
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20	JOHN NYPL, et al.	Case No.: 15 Civ. 9300 (LGS)
21	Plaintiffs,	DECLARATION OF CARL S. SABA
22	V .	
	JP MORGAN CHASE & CO., et al. Defendants.	
23	Dolondants.	
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CARL S. SABA DECLARATION

I, Carl S. Saba, declare as follows:

I am a partner in the Forensic and Financial Consulting Services Group at Hemming Morse, LLP, certified public accountants, and have been engaged by Plaintiffs' counsel as a consultant in connection with the above-captioned case. I make this Declaration in support of Plaintiffs' Third and Fourth Amended Complaints. Except as otherwise stated, this Declaration is based on my personal knowledge and, if called upon to do so, I could and would testify competently to the facts stated herein.

Assignment and Analysis

- 1. I have been engaged by the Alioto Law Firm and Law Offices of Lingel H. Winters ("Counsel") to review data pertaining to spot market fix rates, and analyze whether such fix rates has any relationship to the rates charged to retail consumers and businesses ("End-users") to exchange the EUR / USD currency pair directly with the Defendants.
- Counsel has requested that I analyze the quoted exchange rates for the EUR / USD currency pair offered by Visa and Mastercard to End-users, and their relationship to the spot market fix rates.
- 3. I compared the exchange rates as quoted online by Visa and Mastercard to Endusers, to the European Central Bank spot market fix rate¹ ("ECB Fix Rate") on the same days. The data for Visa and Mastercard was obtained from their online currency converter tool, and in obtaining the rates, I entered a 0% bank fee in order to assess the base exchange rate that they quote before any transaction charges². The chart appended to this declaration summarizes the Visa and Mastercard EUR / USD exchange rates as compared to the ECB Fix Rate. It contains daily quotes from August 1, 2017 through February 21, 2018.

As published by the European Central Bank.

https://www.ecb.europa.eu/stats/policy_and_exchange_rates/euro_reference_exchange_rates/html/index.en.html

² https://usa.visa.com/support/consumer/travel-support/exchange-rate-calculator.html https://www.mastercard.us/en-us/consumers/get-support/convert-currency.html

- 4. The chart indicates that over the period analyzed, the difference between the Visa quoted rate and the ECB Fix Rate is less than 1% on the majority of days. Out of 144 days, I noted that only on 12 days the difference exceeded 1%, and the majority of those days the difference was between 1-2%. In comparing the Mastercard quoted rate to the ECB Fix Rate, for all 144 days the difference was less than 1%.
- 5. Although a direct comparison of the Visa and Mastercard quoted rates to the ECB Fix Rate demonstrates a strong correlation, I further tested the relationship between the data points through a linear regression. The linear regression equation applied a formula by which the ECB Fix Rate is used as an explanatory variable ("X") to predict the Visa or Mastercard End-user rate as dependent variable ("Y"). I applied this regression to the above data of transactions occurring between August 1, 2017 and February 21, 2018.
- The regression I performed indicated a strong fit in how accurately it predicts the Visa or Mastercard end user rate in relation to the ECB Benchmark Fix Rate. That accuracy is 99.00% or better for all of the 144 days for Visa except for one day. On that one day, the accuracy of the regression equation is 98.98%. The accuracy of the regression equation is 99.00% or better for all of the 144 days for Mastercard. The regression analysis demonstrates a direct relationship between the ECB rates and Visa or Mastercard end user bank rates. One can generally predict 99.00% or more of the end user rate quoted by the credit cards (before any transaction fees) in the investigation based on entering the ECB rate into the regression formulas. The regression formulas are Y = 0.9768X + 0.0322 for Visa and Y = 1.0175X 0.0172 for Mastercard. X represents the ECB rate and Y represents the predicted credit card end user rate.
- 7. I reviewed the output of the regression analysis and noted that the R squared was 95.12% for Visa and 99.56% for Mastercard. In a regression analysis, R squared varies between 0% and 100%, and represents a measure of how well the data fits the regression formula. The R squared of over 95% for both credit cards indicated a strong fit between the data and the regression line.
- 8. Additional evidence of a strong fit of the data to the regression line is contained in the F Probability, which is far less than one percent for both Visa and Mastercard. The F Probability tests the null hypothesis that all the regression equation coefficients are zero, meaning that there is

no relationship between the ECB Fix Rate (X) and the credit card End-user rate (Y). The F Probability indicates the likelihood that the null hypothesis is true, and generally a probability below 5% is considered strong evidence that the null hypothesis should be rejected, and that the regression equation has some validity and predictive power. In the regression equations the extremely small F Probabilities well below 1% for both Visa and Mastercard, indicate evidence of predictive power.

9. My analysis leads me to conclude that over the 144 days analyzed, there appears to be a strong correlation between the ECB Fix Rate for the EUR / USD currency pair, and the base exchange rates quoted by Visa and Mastercard to End-users (before addition of transaction fees). For the large majority of days, the variance between the End-user rates and the ECB Fix Rate is less than 1%.

I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

Executed this 28th day of February 2018, at Los Altos, California.

CARL S. SABA

Daily Comparison of Exchange rates EURO/USD (Aug 1, 2017 - Feb 21, 2018)

		es s		Mastercard	Visa to ECB Fix	Mastercard to	Predicted Visa	Mastercard	Regression to	Regression to
								Rate	Rate	Actual Rate
2/21/2018 \$	1,2312	\$ 1.2413	ķ	1.2344	0.82%	0.25%	\$ 1.2348	\$ 1.2356	-0.52%	%60'0
2/20/2018	1,234	1.243576	10-	1.24097	0.78%	0.56%	1.2376	1.2384	-0,48%	-0.21%
2/19/2018	1,241	1.255574	=	1,243369	1,17%	0.19%	1.2444	1.2455	-0.89%	0.17%
2/16/2018	1.2464	1.251175	ĿΛ	1.255187	0.38%	0.70%	1,2497	1.2510	-0.12%	-0.33%
2/15/2018	1.2493	1.246575	Ľń:	1.250939	-0.22%	0.13%	1.2525	1,2540	0.48%	0.24%
2/14/2018	1,2348	1,237176	· G	1.241292	0.19%	0.53%	1.2384	1,2392	0.10%	-0.17%
2/13/2018	1,2333	AN	ěľ	1,237057	NA	0.30%	1.2369	1.2377	NA	0.05%
2/12/2018	1.2263	1.228777	7	1.22948	0.20%	0.26%	1.2301	1.2306	0.10%	%60.0
2/9/2018	1,2273	1.229577	~	1.228668	0.19%	0.11%	1,2310	1.2316	0.12%	0.24%
2/8/2018	1,2252	1.240676	ui.	1.229377	1.26%	0.34%	1.2290	1,2294	-0,94%	0.01%
2/7/2018	1,2338	1.243576	50	1,240182	0.79%	0.52%	1.2374	1,2382	-0.50%	-0.16%
2/6/2018	1,2329	AN	4	1.243005	NA	0.82%	1.2365	1.2373	NA	-0.46%
2/5/2018	1,244	1.251875	ın	1.247274	0.63%	0.26%	1.2473	1.2486	-0.36%	0.10%
2/2/2018	1,2492	1,252375	i0	1,251586	0.25%	0.19%	1.2524	1,2539	0.00%	0.18%
2/1/2018	1.2459	1.247575	· in	1.248545	0.13%	0.21%	1.2492	1.2505	0.13%	0.16%
1/31/2018	1.2457	1.245475	ın	1.247148	-0.02%	0.12%	1.2490	1,2503	0.28%	0.25%
1/30/2018	1.2421	1,246875	ιά·	1.245241	0.38%	0.25%	1,2455	1.2466	-0.11%	0.11%
1/29/2018	1,2379	1,249475	IĄ.	1,243199	0.94%	0.43%	1,2414	1.2424	-0.65%	-0.07%
1/26/2018	1.2436	1.253875	IV.	1.249178	0.83%	0.45%	1.2470	1.2482	-0.55%	0.08%
1/25/2018	1.2407	1,241576	Ġ	1.252996	0.07%	0.99%	1.2441	1.2452	0.21%	-0.62%
1/24/2018	1.2352	1.230677	7	1.239822	-0.37%	0.37%	1.2388	1.2396	0.66%	-0.02%
1/23/2018	1.2249	1.227477	. 2	1,230189	0.21%	0.43%	1,2287	1,2291	0.10%	0.09%
1/22/2018	1.2239	1.229677	7	1.226999	0.47%	0.25%	1.2277	1.2281	-0.16%	%60.0
1/19/2018	1,2255	1.226577	7	1.229158	0.09%	0.30%	1.2293	1.2298	0.22%	0.05%
1/18/2018	1.2235	1,232377		1,226202	0.73%	0.22%	1.2273	1.2277	-0.41%	0.12%
1/17/2018	1,2203	1.228377	2	1.231888	0.66%	0.95%	1.2242	1.2245	0.34%	-0,66%
1/16/2018	1,223	1.229777	7	1.231888	%55'0	0.73%	. 1.2268	1.2272	-0.24%	-0.38%
1/15/2018	1.2277	1.221778	00	1.229384	-0,48%	0.14%	1,2314	1.2320	0.79%	0.21%
1/12/2018	1.2137	1.205979	.0.	1.215286	-0.64%	0.13%	1.2178	1.2177	%86.0	0.20%
1/11/2018	1.2017	1,20188	œ	1.205318	0.01%	0.30%	1.2060	1,2055	0.35%	0.02%
1/10/2018	1,1992	1,19768	00	1.201514	-0.13%	0.19%	1.2036	1,2030	0.49%	0.12%
1/9/2018	1.1932	1,205279	Ó	1.197326	1.01%	0.35%	1.1977	1.1969	-0.63%	-0.04%
1/8/2018	1,1973	1.208379	ō.	1.205154	0.93%	0.66%	1.2017	1,2011	-0.55%	-0.34%
1/5/2018	1,2045	1.208979	O	1.2083	0.37%	0.32%	1.2088	1,2084	-0.02%	0.01%
1,4/2018	1,2065	1.206879	6	1,208858	0.03%	0.20%	1.2107	1.2104	0.32%	0.13%
1/3/2018	1.2023	1.208479	01	1,206575	0.51%	0.36%	1.2066	1,2061	-0.15%	-0.04%
1/2/2018	1,2065	1,20298	œ	1,20804	-0.29%	0.13%	1.2107	1.2104	0.64%	0.20%
12/29/2017	1.1993	1.19598		1,202191	-0.28%	0.24%	1.2037	1.2031	0.64%	0.07%
12/28/2017	1.1934	1,191081	C.	1.195334	-0.19%	0.16%	1.1979	1.1971	0.57%	0.15%
12/27/2017	1.1895	1.188281	, , (1,190918	-0.10%	0.12%	1.1941	1.1931	0.49%	0.18%
12/22/2017	1.1853	1.189081	**	1.18731	0.32%	0.17%	1.1900	1.1888	0.08%	0.13%
12/21/2017	1 1050	00000			100	100	700 5.1	1004	2000	2000

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% Difference	on Visa ed Regression to	Visa Ac Rat	1,1880 0.3	1.1858 0.3				6							1,1901	•	•		1,1989 0.4	1.1913 0.5					1.1829 0.3																1 1010
:5 - - - - -		Mastercard Rate	1.1892	1.1871 1	1.1843 1											1,1951				1.1924					1,1843					•								•			, ,,,,,,
	ice Regression		0.46%	0.06%	0,31%	0.04%		0.30%								0.45%				0.56%					0.20%	0.24%			0.19%	0.18%				0.27%	0.34%			0.24%	0.44%	0.68%	, mary 6
	e % Difference	iii)	0.04%	0.10%	0.15% 0	0.49%	0.10%	0,49%								0.40%				0,17%					0.06%					91.0-				0,26%							,
	% Difference	Spot Rate																			•													£	.0-		-2.				
	A STATE OF THE PERSON AND ADDRESS OF THE PERSON ADDRESS OF THE PERSON AND ADDRESS OF THE PERSON ADDRESS OF THE P	Mastercan	1.189919	1.182979	1.183209	1.181047	1.185744	1.177079	1,179052	1.181034	1.177492	1.180783	1.184532	1,187631	1.187679	1.193867	1.192/30	1.191818	1.195837	1.1944	1.185438	1.179508	1.175646	1.180587	1,181879	1 185967	1.176895	1.167333	1.167607	1,165065	1.161022	1.161386	1.162292	1.168827	1.16848	1.16547	1.166047	1.164035	1.165618	1.183234	
	99	\$ \$	1,184982	1,183482	1.181282	1.186381	1.183282	1.179382	1,181282	1.177882	1.181482	1,243576	1.187781	1.189081	1.194081	1.193281	1.103001	NA	1.194481	1.185681	1.182782	1,175882	1.180982	1.182282	1.180182	1.185081	1167583	1.167883	1.165583	1.161184	1.161684	1,162484	1,169183	1.168783	1.165783	1,166183	1.165883	1.165883	1.183782	1.181882	
	ECB Spot Fix	Rate	1.1845	1.1823	1.1795	1.1806	1.1845	1,1736	1,1766	1,1795	1.1742	1.1786	1.1817	1.1847	1,1865	1.1885	11845	1.1827	1.1952	1.1877	1,1848	1.1749	1,1718	1.1781	1.1795	17/77	11745	1.1656	1,1654	1,163	1,159	1,1562	1,159	1.1657	1,1645	1.1612	1.1538	1.1612	1.1605	1.1753	
		Date	12/20/2017	12/19/2017	12/18/2017	12/15/2017	12/14/2017	12/13/2017	12/12/2017	12/11/2017	12/8/2017	12/7/2017	12/6/2017	12/5/2017	12/4/2017	12/1/2017	11/30/201/	11/29/2017	11/27/2017	11/24/2017	11/23/2017	11/22/2017	11/21/2017	11/20/2017	11/17/2017	11/16/201/	11/14/2017	11/13/2017	11/10/2017	11/9/2017	11/8/2017	11/7/2017	11/6/2017	11/3/2017	11/2/2017	11/1/2017	10/31/2017	10/30/2017	10/27/2017	10/26/2017	

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Daily Comparison of Exchange rates EURO/USD (Aug 1, 2017 - Feb 21, 2018)	

	Date	ECB Spot Fix Rate	Visa	Mastercard	% Difference Visa to ECB Fix Spot Rate	% Difference Wastercard to ECB Fix Spot Rate	Regression Predicted Visa Rate	Regression Predicted Mastercard Rate	% Difference Visa Regression to Visa Actual Rate	% Difference Mastercard Regression to Mastercard Actual Rate
11828 1188881 1188512 0.05% 0.17% 11886 11869 0.06% 11829 11829 0.06% 11829 11829 0.05% 0.12% 0.12% 11829 118292 0.117797 0.05% 0.02% 0.12% 11829 1.18182 0.05% 0.02% 0.12% 1.1829 1.18182 0.05% 0.02% 0.12% 1.1829 1.18182 0.05% 0.02% 0.12% 1.1829 0.12% 0.1	10/23/2017	1.174	1.185881	1.17757	1.01%		1.1790	1,1773		-0.02%
11834 1180822	10/20/2017	1.1818	1.185881	1.185512	0.35%		1.1866	1.1853		-0.02%
11799 1180102 1177972 0.45% 0.25% 11799 117797 0.45% 0.25% 11799 11799 117979 0.65% 0.13% 11799 117979 0.65% 0.13% 11859 11799 0.13% 11850 1187222 0.65% 0.13% 11859 118722 0.65% 0.13% 11859 118722 0.65% 0.13% 11872 118722 0.13% 11872 118722 0.13% 11872 118722 0.13% 11872 118722 0.13% 0.13% 11872 118722 0.13% 0.13% 11872 118722 0.13% 0.13% 11872 0.13% 0.1	10/19/2017	1.1834	1,180582	1.185436	-0.24%		1,1882	1,1869		0.12%
1,1979 1,1878 1,1872 1,1872 1,1884 1,1884 1,1885 1,1872 1,1885 1	10/18/2017	1.1749	1,180182	1.177972	0.45%		1.1799	1.1783	•	0.02%
11863 1187581 1181867 0.65% 0.13% 1.1859 1.1845 0.02% 1.1869 1.1869 1.18724 0.05% 0.13% 1.1869 1.1867 0.13% 0.12% 1.1867 0.13% 0.13% 1.1867 0.13%	10/17/2017	1,1759	1.182582	1.179779	0.57%		1.1808	1.1793		-0.04%
1,181 1,187021 1,18722 0,050% 0,135% 1,1855 1,1845 0,17% 1,18762 1,18762 0,137% 1,18762 1,18762 0,137% 1,18762 1,18762 0,137% 1,18762 1,18762 0,137% 1,18762 1,18762 0,137% 1,18762 1,18762 0,137% 1,18762 1,18762 0,137% 1,18762 1,18762 0,137% 1,18762 0,137% 1,17862 0,137% 1,17862 0,137% 1,17862 0,137% 1,17862 0,137% 1,17862 0,137% 1,17862 0,137% 1,17862 0,137% 1,17862 0,137% 1,17862 0,137% 1,17862 0,137% 1,17862 0,137% 1,17862 0,137% 1,18762 0,137% 1,17862 0,137% 1,18762 0,137% 1,18762 0,137% 1,18762 0,137% 1,18762 0,137% 1,18762 0,137% 1,18762 0,137% 1,18762 0,137% 1,18762 0,137% 1,18762 0,137% 1,18762 0,137% 1,18762 0,137% 1,18762 0,137% 1,18762 0,137% 1,18762 0,137% 1,18762 0,137% 1,18762 0,137% 1,18762 0,137% 1,18762 0,137% 0,137% 1,18762 0,137% 0,13	10/16/2017	1,1803	1,187581	1.181862	0.62%		1,1851	1.1838		0.16%
11885	10/13/2017	1.181	1.188081	1.187229	0.60%		1,1858	1.1845	,	-0.23%
1,183 1,185,262 0,03% 0,19% 1,187 1,185 0,04% 1,187 1,185 0,03% 1,187 1,177 1,178 1,177 1,178 1,177 1,178 1,177 1,178 1,177 1,178 1,177 1,178 1,177 1,178 1,177 1,178 1,177 1,178 1,177 1,178 1,177 1,187 1,177 1,187 1,177 1,187 1,177 1,187 1,177 1,187 1,177 1,187	10/12/2017	1,1856	1.187081	1.187824	0.12%		1.1903	1.1892		0.11%
1,1797 1,175882 1,1819 0,34% 0,12% 1,12845 1,1784 0,178 1,17845 1,17845 0,178 1,17845 1,17848 0,17784 0,17848 1,17784 0,17784 0,17848 0,17784 0,17	10/11/2017	1.183	1.182682	1.185675	%E0'0-		1.1878	1.1865		0.07%
11746 117782	10/10/2017	1,1797	1.175682	1.1819	-0.34%		1.1845	1.1831		0.11%
1,1707 1,17862 1,177634 0,62% 0,22% 1,1756 1,1740 0,12% 1,1764 1,17882 1,177634 0,02% 1,1786 1,17864 1,177634 0,11% 0,12% 1,1786 1,1786 0,02% 1,1836 1,1872 1,17763 0,13% 1,1876	10/9/2017	1.1746	NA	1.174785	NA		1.1796	1.1780		8/770
1,1742 1,17882 1,17843 0,40% 0,25% 1,1792 1,179 1,1784 0,02% 1,179 1,178 0,02% 1,179 1,178 0,02% 1,179 1,178 0,13% 1,178 0,13% 1,178 1,178 0,13% 1,178 0,13% 1,178 0,13% 1,178 0,13% 1,178 0,13% 1,178 0,13% 1,178 0,13% 1,178 0,13% 1,178 0,13% 1,178 0,13% 1,178 0,13% 1,188	10/6/2017	1,1707	1.177982	1.173663	0.62%		1.1758	1.1/40		0.03%
1,175	10/5/2017	1.1742	1.178882	1.1//634	0.40%		11836	1.1821		%UE 0
11806 1180482 1181374 0.0196 0.2196 1.1794 1.18134 0.0248 0.2196 1.1894 1.1778 0.2486 1.18042 1.18043 0.0196 0.2196 1.18674 1.18671 0.0248 0.1968 1.18628 1.18012 0.0296 0.1968 1.18072 1.18073 0.1968 1.18072 1.18073 0.1968 0.1968 1.18072 1.18072 0.1968 0.1968 1.18072 1.18072 0.1968 0.1968 1.18072 1.18072 0.1968 0.1968 1.18072 1.18072 0.1968 0.1968 0.1968 1.18072 1.20072 0.12072 0.	10/4/201/	1.1753	1.17/362	1.172147	7.T.O.		1,1802	1.1787		0.13%
1.1866 1.180482 1.183681 -0.01% 0.21% 1.1854 1.1841 0.25% 1.1778 1.179522 1.180053 0.01% 1.1877 1.1812 0.55% 1.1778 1.136281 1.18053 0.01% 0.19% 1.1877 1.1812 0.55% 1.1761 1.136281 1.18053 0.16% 0.53% 1.1875 -0.61% 0.56% 1.1867 1.20048 1.1354 1.1354 1.1971 1.1973 -0.76% 1.1967 1.20048 1.2005 0.63% 1.2006 1.1987 1.1998 0.74% 1.2007 1.20039 0.01% 0.15% 1.1991 1.1968 0.36% 1.1972 1.19878 1.120039 0.01% 0.15% 1.1991 1.1993 0.04% 1.1972 1.19878 1.120039 0.01% 0.15% 1.1991 1.1904 0.36% 1.1974 1.19878 1.19878 1.19878 1.1993 1.1994 0.36% 1.197	710/2/2017	11744	1.183382	1.181374	0.76%		1.1794	1.1778		-0.31%
1,1778 1,1862 1,1805 0,15% 0,15% 1,1827 1,1812 0,26% 1,1741 1,18621 1,18943 0,43% 1,187 1,1775 -0.61% 1,1767 1,1861 1,1864 1,4864 0,63% 1,187 1,105% 1,1867 1,20048 1,19626 1,1867 1,1867 1,1897 1,1897 1,1965 1,20048 1,2007 1,19636 0,05% 1,1997 1,1997 1,1966 1,1967 1,200392 0,013% 0,13% 1,1997 0,43% 1,1968 1,1967 1,200392 0,013% 0,13% 1,1993 1,1998 0,43% 1,1968 1,1967 0,013% 0,13% 1,1993 1,1991 0,04% 1,1993 0,19% 0,19% 1,1993 0,19% 0,14% 1,1993 0,14% 0,14% 0,14% 0,14% 0,14% 0,14% 0,14% 0,14% 0,14% 0,14% 0,14% 0,14% 0,14% 0,14% 0,14%	9/29/2017	1.1806	1.180482	1.183081	-0.01%		1.1854	1.1841	0.42%	%80'0
11761 1186281 117953 104% 0.43% 11791 11775 0.61% 11867 1.19648 1.1864 1.1864 1.1864 1.1824 -1.06% 1.1867 1.20048 1.2067 1.1964 1.2066 1.1998 0.43% 1.1961 1.1964 0.63% 1.2066 1.1998 0.43% 1.1962 1.20038 1.20038 0.01% 0.25% 1.1998 0.43% 1.1962 1.20078 1.200392 0.01% 0.27% 1.2066 1.1998 0.43% 1.1972 1.1978 1.196634 0.01% 0.27% 1.2066 0.03% 0.44% 1.1973 1.1978 1.196634 0.03% 0.15% 1.2069 0.04% 1.1973 1.1978 1.19664 0.93% 0.15% 1.1971 0.54% 1.1974 1.1978 1.19664 0.03% 0.15% 1.1971 0.54% 1.1979 1.1997 1.19664 0.03% 0.15% 1.	9/28/2017	11778	1.179582	1.180053	0.15%		1.1827	1.1812		0.10%
11787 119618 1.4884 0.63% 1.1856 1.105% 1.05% 1.1867 1.20048 1.2034 1.1903 -0.76% 1.1965 1.20048 0.55% 1.1914 1.1903 -0.76% 1.1965 1.20048 1.2034 1.2006 1.1998 0.43% 1.1966 1.20078 1.201982 0.01% 0.15% 1.1991 0.43% 1.1972 1.1978 1.200392 0.01% 0.27% 1.201 1.2045 0.36% 1.1972 1.1978 1.196634 0.03% 0.15% 1.201 0.36% 0.36% 1.1963 1.1978 1.196634 0.03% 0.15% 1.2045 0.36% 1.1973 1.1978 1.196634 0.03% 0.16% 1.2041 0.54% 1.1973 1.1978 1.196634 0.09% 0.09% 1.2023 1.2047 0.54% 1.1974 1.1978 1.196644 0.09% 0.09% 1.2043 1.1970 0.54% <td>9/27/2017</td> <td>1.1741</td> <td>1.186281</td> <td>1.179153</td> <td>1.04%</td> <td></td> <td>1.1791</td> <td>1.1775</td> <td></td> <td>-0.14%</td>	9/27/2017	1.1741	1.186281	1.179153	1.04%		1.1791	1.1775		-0.14%
1,1967 1,19648 1,19548 1,19548 1,19526 1,1964 1,1967 1,1	9/26/2017	1.1787	1.19618	1.1861	1.48%		1.1836	1.1821		-0.33%
11964 1,10548 1,200202 0.039% 0.34% 1,1050 1,1954 0.43% 1,1965 1,2007 1,20038 1,1954 1,08% 0,33% 1,1951 1,1941 0.58% 1,2007 1,20078 1,2018 0,019% 0,27% 1,2045 1,048 0,38% 1,1972 1,199708 1,19653 0,019% 0,15% 1,1993 1,1985 0,04% 1,1963 1,19578 1,196634 0,33% 0,15% 1,1993 1,1985 0,04% 1,1963 1,1958 1,196634 0,33% 0,18% 1,2016 1,2046 0,33% 1,1963 1,1958 1,196634 0,33% 0,18% 1,2016 1,2046 0,04% 1,1973 1,1958 1,196634 0,93% 0,18% 1,2016 1,2046 0,04% 1,1974 1,1996 0,93% 0,19% 0,27% 1,2016 0,13% 0,44% 1,1974 1,2051 1,2061 0,27% 1,2023	9/25/2017	1.1867	1,20048	1.193256	1.16%		1,1914	1.1903		%570- %500
1,1903 1,2034 1,2034 1,2034 1,2034 1,2034 1,2034 1,2034 1,2034 1,2034 1,2034 1,2034 1,2034 1,2034 1,2034 1,2035 1,2045 1,2046<	9/22/2017	1,1961	1,19548	1,200202	70.U- 70.U5%		1.2006	1 1971		%60.0-
1.1972 1.19708 1.200392 -0.01% 0.27% 1.2016 1.2010 0.33% 1.1963 1.19678 1.19678 1.19678 1.19678 1.19678 0.04% 0.05% 0.18% 0.1993 0.04%	9/21/201/	1 2007	1.20078	1,201982	0.01%		1,2051	1.2045		0.21%
1.1963 1.19678 1.196634 0.33% 0.15% 1.1993 1.1987 0.04% 1.1963 1.197281 1.19678 1.19678 1.19678 1.2006 0.71% 1.1865 1.197281 1.196634 0.93% 0.18% 1.2008 1.2000 0.71% 1.1979 1.19788 1.19864 0.00% 0.08% 1.2023 1.2047 0.54% 1.1973 1.20408 1.197749 0.00% 0.24% 1.2043 1.1970 0.52% 1.1971 0.2048 0.24% 1.2041 1.2035 0.44% 1.1971 0.2098 0.24% 1.2041 1.2035 0.44% 1.1971 1.194181 1.194784 0.09% 0.26% 1.2041 1.2035 0.44% 1.1971 1.194784 0.09% 0.13% 1.1976 1.1968 0.10% 1.1904 1.19248 1.195058 0.64% 0.136 1.1966 0.10% 0.47% 1.1966 1.1964 0.09%	9/19/2017	1.1972	1.19708	1.200392	-0.01%		1,2016	1.2010		0.05%
11963 1,192281 1,198263 -0.34% 0.168% 1,2008 1,2000 0,71% 1,1875 1,1978 1,1978 1,1978 1,1979 1,1971 0,24% 1,1971 0,54% 1,1979 1,1978 1,1976 0,18% 1,1971 1,1971 0,52% 1,1979 1,20408 1,19749 0,00% 0,24% 1,2041 1,2035 0,44% 1,1971 1,20408 1,19749 0,00% 0,24% 1,2041 1,2035 0,44% 1,1971 1,2047 1,2041 1,2043 0,44% 0,44% 1,1971 1,2047 0,26% 1,2041 1,2035 0,44% 1,1971 1,19418 1,194784 0,09% 0,14% 1,1976 1,1968 0,10% 1,190 1,19281 1,194784 0,09% 0,13% 1,1976 1,1968 0,10% 1,190 1,19764 1,19764 1,2042 1,1966 1,1941 0,25% 1,194 1,19784	9/18/2017	1,1948	1,19878	1,196634	0.33%		1,1993	1.1985		0,16%
1,185 1,1958 1,190654 0,93% 0,18% 1,1921 -0,54% 1,1979 1,1978 1,19864 0,00% 0,09% 1,2023 1,2017 0,37% 1,1979 1,1978 1,19749 0,00% 0,03% 1,2023 1,2047 0,52% 1,197 1,2048 1,2047 1,2041 1,2035 0,44% 1,197 1,20579 1,209124 0,00% 0,26% 1,2041 1,2035 0,44% 1,197 1,20579 1,209124 0,00% 0,26% 1,2041 1,2035 0,44% 1,197 1,194181 1,20474 0,09% 0,14% 1,1976 1,1968 0,139% 1,190 1,194181 1,194784 0,09% 0,13% 1,1976 1,1941 0,25% 0,13% 1,1976 1,1941 0,25% 1,190 1,197643 0,64% 0,13% 1,1966 1,1977 0,43% 1,1966 1,1967 0,93% 1,192 1,1948 1,19743	9/15/2017	1.1963	1,192281	1.198263	-0.34%		1.2008	1.2000		0.15%
1,1979 1,1978 1,19864 0,00% 0,09% 1,2023 1,2017 0,37% 1,1933 1,20408 1,19749 0,99% 0,37% 1,1978 1,1970 -0.52% 1,1937 1,20408 1,1978 1,1970 -0.52% -0.44% 1,1971 1,20579 1,205124 0,00% 0,26% 1,2041 1,2035 -0.44% 1,1971 1,20579 1,205179 0,00% 0,26% 1,2042 1,2099 0,35% 1,1971 1,194181 1,194784 0,09% 0,14% 1,1976 1,1968 0,10% 1,1972 1,1968 1,19784 0,09% 0,13% 1,1936 1,1941 -0,25% 1,197 1,197643 0,05% 0,47% 1,1966 1,1941 -0,25% 1,192 1,1948 1,19045 1,35% 0,67% 1,1873 1,1860 -0,90% 1,194 1,1978 1,1974 1,2041 1,2052 0,90% 1,194 1,1978	9/14/2017	1.1885	1.19958	1.190654	%26'0		1.1931	1.1921		0.12%
1,1933 1,20408 1,19749 0.99% 0.37% 1,1976 -0.22% 1,1997 1,2043 1,2043 0.24% 1,2041 1,2035 0.44% 1,1967 1,209379 1,209124 0,00% 0,26% 1,2041 1,2035 0.54% 1,1971 NA 1,2057 1,209124 0,00% 0,26% 1,2045 1,2099 0,35% 1,1931 1,194181 1,194784 0,09% 0,14% 1,1976 1,1968 0,29% 1,1905 1,192281 1,19784 0,09% 0,13% 1,1976 1,1941 -0,25% 1,190 1,19368 1,197643 0,05% 0,47% 1,1966 1,1941 -0,25% 1,182 1,1948 1,19045 1,35% 0,67% 1,1873 1,1860 -0,93% 1,194 1,2045 1,30% 0,53% 1,1962 1,1963 -0,90% 1,194 1,2045 1,30% 0,53% 1,1966 1,1963 -0,90% <	9/13/2017	1.1979	1.19788	1.198964	0.00%		1.2023	1.2017		0.23%
1.1997 1.2093339 1.209124 0.00% 0.25% 1.2002 1.2099 0.35% 1.1906 1.209124 0.00% 0.26% 1.2002 1.2099 0.35% 1.1931 1.194181 1.194784 0.09% 0.14% 1.1976 1.1968 0.23% 1.189 1.19281 1.194784 0.09% 0.13% 1.1976 1.1968 0.10% 1.190 1.19281 1.19365s 0.64% 0.13% 1.1951 1.1941 -0.25% 1.192 1.19184 1.197643 -0.05% 0.47% 1.1966 1.1947 -0.25% 1.182 1.1948 1.19045 1.35% 0.67% 1.1873 1.1860 -0.93% 1.194 1.207079 1.197954 1.30% 0.55% 0.15% 1.1962 0.90% 1.194 1.1948 1.206617 0.52% 0.47% 1.1962 0.90% 1.194 1.1973 0.15% 0.45% 1.1962 0.90% 1.195	9/12/2017	1,1933	1.20408	1.197749	0.90%		1,2041	1.19/0		90.0
1.1971 NA 1.2015 1.2015 NA 1.1931 1.194181 1.194784 0.09% 0.14% 1.1976 1.1968 0.29% 1.189 1.192281 1.193655 0.28% 0.64% 1.1976 1.1968 0.10% 1.1905 1.192281 1.192058 0.64% 0.13% 1.1951 1.1941 -0.25% 1.192 1.191381 1.197643 -0.05% 0.47% 1.1966 1.1957 0.43% 1.182 1.19348 1.19045 1.35% 0.67% 1.1873 1.1860 -0.93% 1.1946 1.207079 1.197954 1.30% 0.55% 0.159% 1.1962 0.90% 1.2048 1.1948 1.206617 0.52% 0.15% 1.2091 1.2087 0.38% 1.192 1.1973 0.15% 0.15% 1.1962 0.23% 1.194 1.1973 0.15% 0.15% 1.1962 0.23% 1.194 1.1973 0.15% 0.15% 0	7107/11/6	1397	1.2035/5	1 209124	%00.0		1.2102	1.2099		0.06%
1.183 1.19481 1.194784 0.09% 0.14% 1.1976 1.1968 0.29% 1.189 1.19281 1.19365s 0.28% 0.39% 1.1936 1.1926 0.10% 1.190 1.19281 1.192058 0.64% 0.13% 1.1951 1.1941 0.25% 1.192 1.19181 1.197643 0.05% 0.47% 1.1966 1.1977 0.43% 1.182 1.1948 1.19045 1.35% 0.67% 1.1873 1.1860 0.93% 1.1916 1.207079 1.197954 1.30% 0.53% 1.1962 1.1963 0.93% 1.2048 1.1948 1.206617 0.52% 0.15% 1.2091 1.2087 0.38% 1.192 1.1973 0.15% 0.15% 1.1962 0.23% 1.192 1.1973 0.15% 0.15% 1.1962 0.23% 1.192 1.1973 0.15% 0.15% 1.1962 0.23%	7102/2/6	1,1971	AN AN	1,205179	NA		1,2015	1.2009		~0.36%
1.189 1.192881 1.193655 0.28% 0.59% 1.1936 1.1926 0.10% 1.1905 1.19808 1.192058 0.64% 0.13% 1.1951 1.1941 0.25% 1.192 1.191381 1.197643 0.05% 0.47% 1.1966 1.1957 0.43% 1.1825 1.19748 1.19743 1.25% 0.67% 1.1873 1.1860 0.93% 1.1916 1.207079 1.197954 1.30% 0.53% 1.1962 1.1963 0.90% 1.2048 1.19948 1.206617 0.52% 0.15% 1.2091 1.2087 0.88% 1.1925 1.1973 0.15% 0.15% 1.1962 0.23% 1.1925 1.1973 0.15% 0.15% 1.1962 0.23%	9/6/2017	1.1931	1.194181	1.194784	%60.0		1,1976			0.17%
1.1905 1.192088 0.64% 0.13% 1.1951 1.1941 -0.25% 1.192 1.191381 1.197643 -0.05% 0.47% 1.1966 1.1957 0.43% 1.1825 1.1948 1.19045 1.35% 0.67% 1.1873 1.1860 -0.93% 1.1916 1.207079 1.197954 1.30% 0.53% 1.1962 1.1953 -0.90% 1.2048 1.1948 1.206617 -0.52% 0.15% 1.2091 1.2087 0.88% 1.1925 1.1973 0.15% 0.40% 1.1966 1.1967 0.23%	9/5/2017	1.189	1.192381	1.193655	0.28%		1.1936	1.1926	0.10%	%60.0-
1.192 1.191381 1.197643 -0.05% 0.47% 1.1966 1.1957 0.43% 1.1825 1.19848 1.19045 1.35% 0.67% 1.1873 1.1860 -0.93% 1.1916 1.207079 1.197954 1.30% 0.53% 1.1962 1.1963 -0.90% 1.2048 1.19948 1.206617 -0.52% 0.15% 1.2091 1.2087 0.88% 1.1925 1.1973 0.15% 0.40% 1.1962 1.1962 0.23%	9/4/2017	1.1905	1.19808	1.192058	0.64%		1,1951		-0.25%	0.17%
1.1825 1.19848 1.19045 1.35% 0.67% 1.1873 1.1860 -0.93% 1.1916 1.207079 1.19754 1.30% 0.53% 1.1962 1.1953 -0.90% 1.2048 1.206617 -0.52% 0.15% 1.2091 1.2087 0.88% 1.1925 1.19728 1.1973 0.15% 0.40% 1.1960 1.1960 0.73% 1.1960 1.1973 0.73%	9/1/2017	1.192	1.191381	1.197643	~0.05%		1.1966			-0.17%
1.1916 1.207079 1.197954 1.30% 0.53% 1.1962 1.1953 -0.50% 1.2048 1.1948 1.205617 -0.52% 0.15% 1.2091 1.2097 0.88% 1.1973 0.15% 0.40% 1.1970 1.1962 0.23% 0.23% 1.1970 1.1970 0.73%	8/31/2017	1,1825	1.19848	1.19045	1.35%		1.1873	1.1860		-0.3/%
1.1925 1.194281 1.1973 0.15% 0.15% 1.1097 1.1970 0.129% 0.15% 0.100% 1.1970 1.1970 0.129%	8/30/2017	1,1916	1.207079	1.197954	1.30%		1,1962	1.1953		-0.23%
1.1925 1.194281 1.1973 0.15% 0.140% 1.1974 1.1992 0.15%	8/29/2017	1.2048	1.19848	1.206617	-0.52%		1.2091	1.2087		300 C
	8/28/2017	1.1925	1.194281	1.1973	0.15%		1.19/U	1.1902		, C. C.

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% Difference % Difference Visa Mastercard Regression to Regression to Visa Actual Actual Rate Actual Rate	0,25% 0,18%		-0.07% -0.15%	0.30% -0.21%				-0,39% -0,11%	NA -0.04%	•	0.14% -0.03%			-0.37% 0.16%		-0.02% 0.04%	0.25% -0.06%
E + 72	1,1841	1.1834	1.1805	1.1795	1.1773	1,1730	1.1743	1.1778	1.1831	1.1799	1,1765	1.1764	1.1849	1.1831	1.1904	1.1896	1.1864
Regression Regression Regression Predicted Visa to ECB Fix Mastercard to Predicted Visa Mastercard to Predicted Visa Mastercard Spot Rate ECB Fix Spot Rate Rate Rate	1.1854	1.1847	1.1820	1.1810	1,1790	1.1748	1.1760	1.1794	1.1845	1,1814	1.1782	1.1781	1.1862	1.1845	1.1915	1.1907	1.1877
% Difference Mastercard to ECB Fix Spot Rate	0.11%	0.17%	0.44%	0.50%	0.28%	0.76%	0.39%	0.40%	0.33%	0.56%	0.31%	0.27%	0.05%	0.14%	0.18%	0.26%	0.36%
% Difference Visa to ECB Fix Spot Rate E	0.16%	0.23%	0.49%	0.12%	0.43%	0.71%	0.72%	0.82%	NA	0.19%	0.29%	0.80%	0.01%	0.79%	0.22%	0.42%	0.15%
Mastercard	1.1819	1.1819	1.182283	1,181985	1.177236	1.178585	1.175607	1.179096	1,183629	1,183059	1.176868	1,176227	1.182026	1.1813	1.188899	1.189077	1.1871
Visa	1,182482	1.182582	1.182882	1,177482	1.179082	1.177982	1.179382	1.183982	NA	1.178682	1.176582	1.182482	1,181482	1.188981	1.189381	1,190981	1.184582
ECB Spot Fix Rate	1.1806	1,1799	1,1771	1,1761	1,174	1,1697	1,171	1.1744	1.1797	1.1765	1.1732	1,1731	1.1814	1,1797	1.1868	1.186	1.1829
Date	8/24/2017	8/23/2017	8/22/2017	8/21/2017	8/18/2017	8/17/2017	8/16/2017	8/15/2017	8/14/2017	8/11/2017	8/10/2017	8/9/2017	8/8/2017	8/7/2017	8/4/2017	8/3/2017	8/2/2017